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प्रेषण तथा वाहकों के लिए दोहरी पिच वाली
परिशुद्धि रोलर चेनें तथा दन्तुरिका

Indian Standard

**DOUBLE-PITCH PRECISION ROLLER CHAINS AND
SPROCKETS FOR TRANSMISSION AND
CONVEYORS**

ICS 21.220.30

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

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Price Group 7

NATIONAL FOREWORD

This Indian Standard which is identical with ISO 1275 : 1995 'Double-pitch precision roller chains and sprockets for transmission and conveyors' issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on the recommendations of the Transmission Devices Sectional Committee and approval of the Medical Instruments, General and Production Engineering Division Council.

The text of the ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

- a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.
- b) Comma (,) has been used as a decimal marker in the International Standard while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

CROSS REFERENCES

In the adopted standard reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their place are listed below along with their degree of equivalence for the editions indicated:

<i>International Standard</i>	<i>Corresponding Indian Standard</i>	<i>Degree of Equivalence</i>
ISO 286-2 : 1988 ISO System of limits and fits — Part 2 : Tables of standard tolerances grades and limit deviations for holes and shafts	IS 919 (Part 2) : 1993 ISO system of limits and fits: Part 2 Tables of standard tolerances grades and limit deviations for holes and shafts (<i>first revision</i>)	Identical
ISO 606 : 1994 Short pitch transmission precision roller chains and chain wheels	IS 2403 : 1991 ¹⁾ Short pitch transmission precision roller chains and chain wheels (<i>third revision</i>)	Identical with ISO 606 : 1982

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

¹⁾ Under Revision.

Indian Standard

DOUBLE-PITCH PRECISION ROLLER CHAINS AND SPROCKETS FOR TRANSMISSION AND CONVEYORS

1 Scope

This International Standard specifies requirements for double-pitch precision roller chains suitable for the mechanical transmission of power and for conveyors, together with those for their associated sprockets. It covers dimensions, tolerances, length measurement, proof testing and minimum tensile strengths.

These double-pitch chains have been derived from some of the short-pitch transmission precision roller chains covered by ISO 606 having certain common dimensions but of double the pitch.

The chains are intended for use under less onerous conditions with respect to speed and power transmitted than are the base chains from which they are derived.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publi-

cation, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 286-2:1988, *ISO system of limits and fits — Part 2: Tables of standard tolerance grades and limit deviations for holes and shafts*.

ISO 606:1994, *Short-pitch transmission precision roller chains and chain wheels*.

3 Transmission chains

3.1 Nomenclature of assembly and components

The nomenclature of the chain assembly and its component parts is illustrated in figures 1 and 2; the figures do not define the actual form of the chain plates.

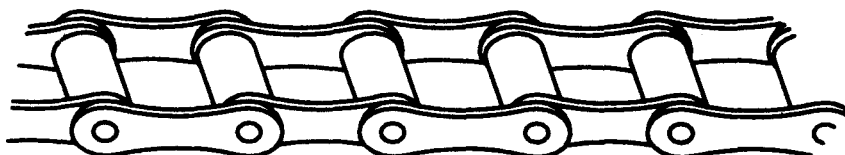
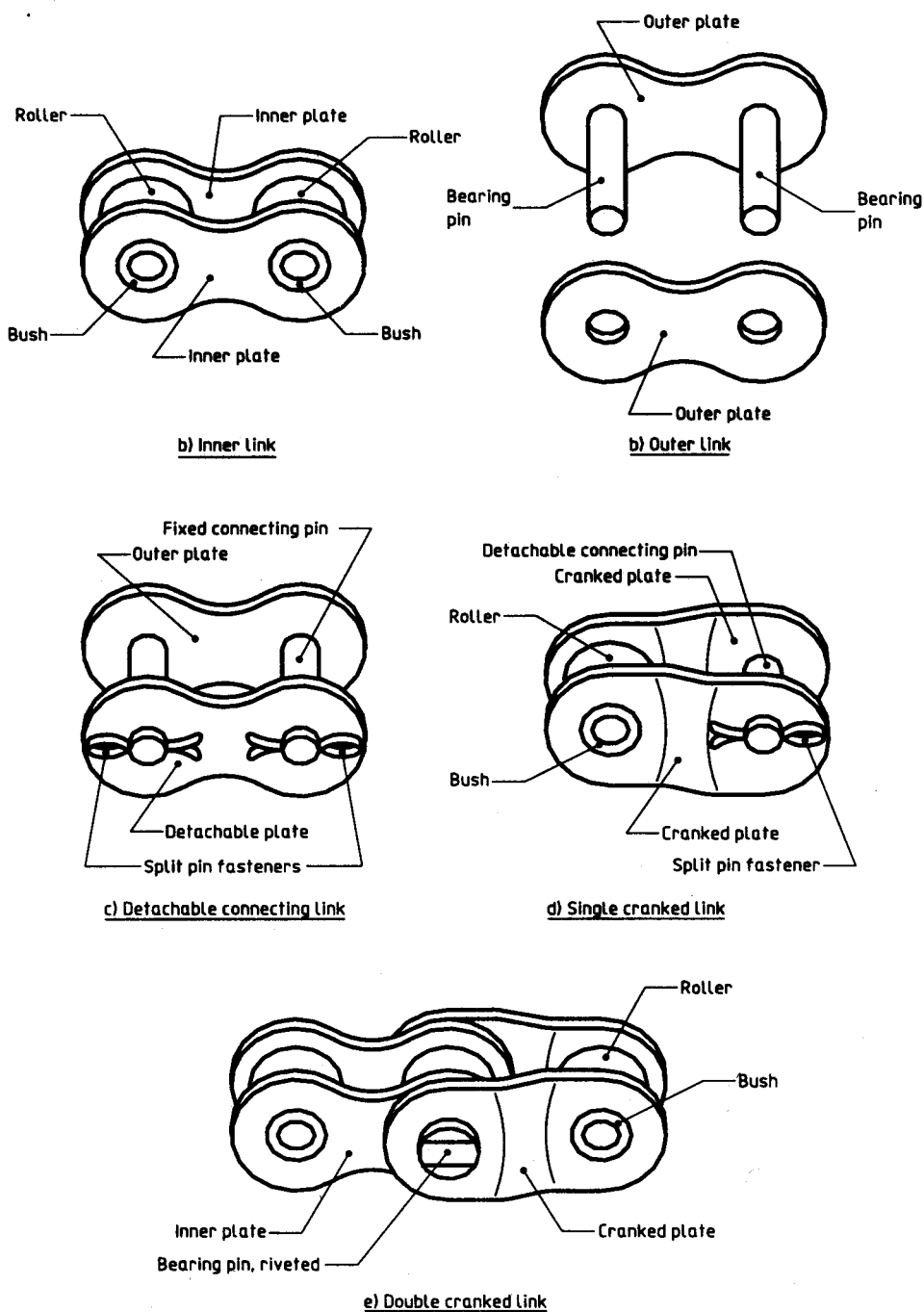


Figure 1 — Chain assembly



NOTES

- 1 The dimensions of the plates are specified in table 1.
- 2 Fasteners may be of various designs. Drawings indicate some examples.

Figure 2 — Types of link

3.2 Designation

Double-pitch transmission precision roller chains shall be designated by the standard ISO chain numbers given in table 1. These chain numbers have been obtained by taking the ISO chain number for the base chain, given in ISO 606, and adding the prefix 2.

EXAMPLE 1

Chain ISO 1275-208B

3.3 Dimensions

Chains shall conform to the dimensions shown in figure 3 and given in table 1. Maximum and minimum dimensions are specified to ensure interchangeability of links produced by different makers of chain. They represent limits for interchangeability, but are not the manufacturing tolerances.

For the purposes of this International Standard, dimensions for the double-pitch simplex chains only are shown.

3.4 Tensile testing

3.4.1 The minimum tensile strength is that value which shall be exceeded when a tensile force is applied to a sample which is tested to destruction as defined in 3.4.2. This minimum tensile strength is not a working force. It is intended primarily as a comparative figure between chains of various constructions. For application information, the manufacturers or their published data should be consulted.

3.4.2 A tensile force, not less than that specified in table 1, shall be applied slowly to the ends of a chain length, containing at least five free pitches, by means of shackles permitting free movement on both sides of the chain centreline, in the normal plane of articulation.

Failure shall be considered to have occurred at the first point where increasing extension is no longer accompanied by increasing force, i.e. the summit of the force/extension diagram.

Tests in which failures occur adjacent to the shackles shall be disregarded.

3.4.3 The tensile test shall be considered a destructive test. Even though a chain may not visibly fail when subjected to a force equivalent to the minimum tensile strength, it will have been stressed beyond the yield point and will be unfit for service.

3.5 Proof testing

It is recommended that all chains should be proof tested by applying a tensile force equivalent to one-third of the minimum tensile strength given in table 1.

3.6 Length accuracy

Finished chains shall be measured after proof testing but before lubricating.

The standard length for measurement shall be a minimum of

- a) 610 mm for ISO chain numbers 208A to 210B inclusive,
- b) 1 220 mm for ISO chain numbers 212A to 232B inclusive,

and the chain shall terminate with an inner link at each end.

The chain shall be supported throughout its entire length, and the measuring force given in table 1 shall be applied.

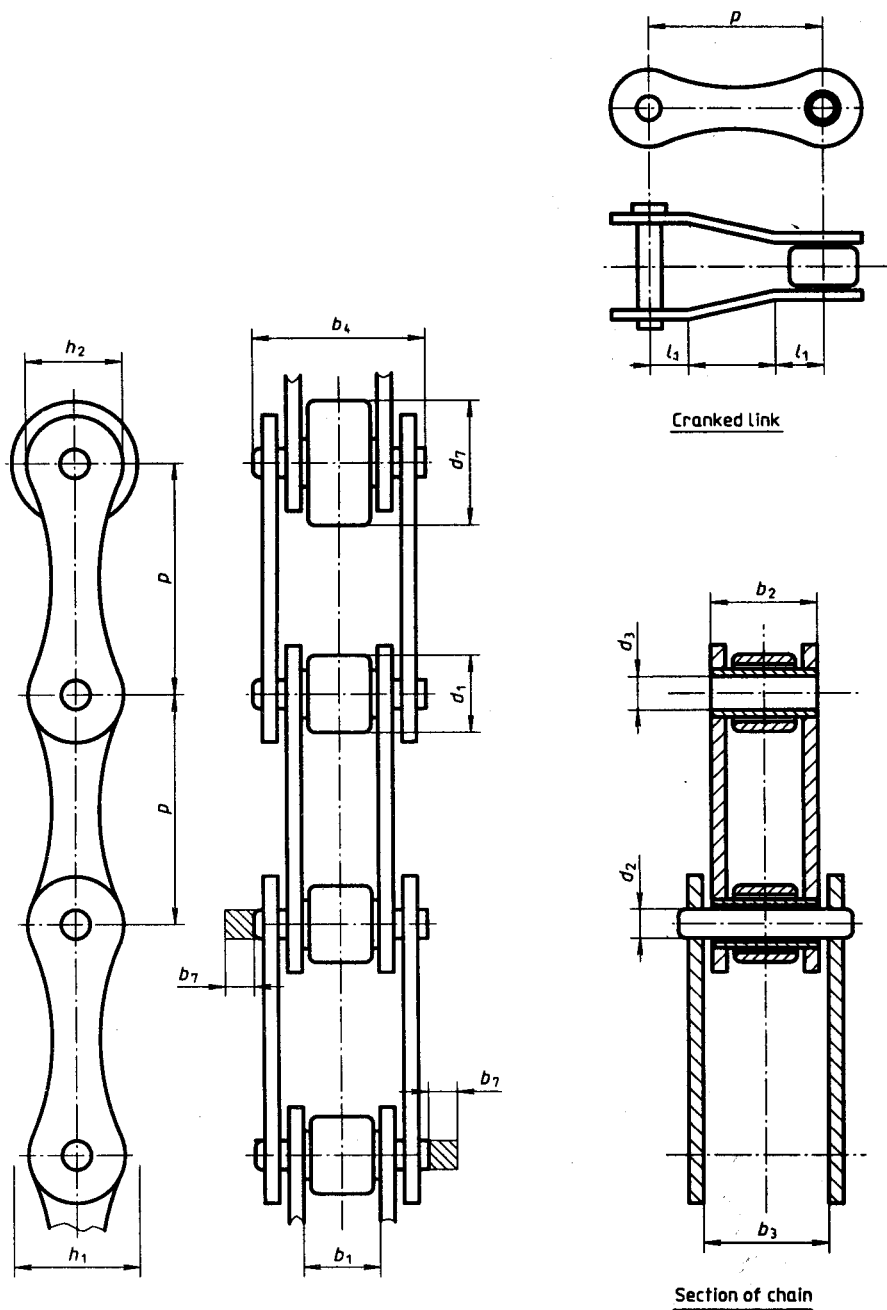
The measured length shall be the nominal length subject to a tolerance of $^{+0,15}_0$ %.

The length accuracy of chains which have to work in parallel shall be within the above limits but matched by agreement with the manufacturer.

3.7 Marking

The chains shall be marked with the manufacturer's name or trademark.

It is recommended that the chains should be marked with the ISO chain number quoted in table 1.



The chain path depth h_1 is the minimum depth of channel through which the assembled chain with small rollers will pass.

The overall width of a chain with a joint fastener is

$b_4 + b_7$ for riveted pin end and fastener on one side;

$b_4 + 1.6 b_7$ for headed pin end and fastener on one side;

$b_4 + 2 b_7$ for fasteners on both sides.

Figure 3 — Chains

Table 1 — Principal dimensions, measuring forces and tensile strengths (see figure 3)

ISO chain number	Pitch	Roller diameter (small) ¹⁾	Roller diameter (large) ¹⁾	Width between inner plates	Bearing pin body diameter	Bush bore	Chain path depth	Plate depth	Cranked link ²⁾	Width over inner link	Width between outer plates	Width over bearing pin	Additional width for joint fastener ³⁾	Measuring force	Tensile strength
	p	d_1	d_2	b_1	d_2	d_3	h_1	h_2	l_1	b_2	b_3	b_4	b_5	N	min.
	mm														
208A	25,4	7,95	15,88	7,85	3,98	4	12,33	12,07	6,9	11,18	11,31	17,8	3,9	120	13,8
	25,4	8,51	15,88	7,75	4,45	4,5	12,07	11,81	6,9	11,3	11,43	17	3,9	120	18
210A	31,75	10,16	19,05	9,4	5,09	5,12	15,35	15,09	8,4	13,84	13,97	21,8	4,1	200	21,8
	31,75	10,16	19,05	9,65	5,08	5,13	14,99	14,73	8,4	13,28	13,41	19,6	4,1	200	22,4
212A	38,1	11,91	22,23	12,57	5,96	5,98	18,34	18,08	9,9	17,75	17,88	26,9	4,6	280	31,1
	38,1	12,07	22,23	11,68	5,72	5,77	16,39	16,13	9,9	15,62	15,75	22,7	4,6	280	29
216A	50,8	15,88	28,58	15,75	7,94	7,96	24,39	24,13	13	22,61	22,74	33,5	5,4	500	55,6
	50,8	15,88	28,58	17,02	8,28	8,33	21,34	21,08	13	25,45	25,58	36,1	5,4	500	60
220A	63,5	19,05	39,67	18,9	9,54	9,56	30,48	30,18	16	27,46	27,59	41,1	6,1	780	86,7
	63,5	19,05	39,67	19,56	10,19	10,24	26,68	26,42	16	29,01	29,14	43,2	6,1	780	95
224A	76,2	22,23	44,45	25,22	11,11	11,14	36,55	36,2	19,1	35,46	35,59	50,8	6,6	1 110	124,6
	76,2	25,4	44,45	25,4	14,63	14,68	33,73	33,4	19,1	37,92	38,05	53,4	6,6	1 110	160
228B	88,9	27,94	—	30,99	15,9	15,95	37,46	37,08	21,3	46,58	46,71	65,1	7,4	1 510	200
	101,6	29,21	—	30,99	17,81	17,86	42,72	42,29	24,4	45,57	45,7	67,4	7,9	2 000	250

1) Large rollers are principally for conveyor chains but are sometimes used on transmission chains; add suffix "L" to chain number.

2) Cranked links are not recommended for use on chains which are intended for onerous conditions.

3) The actual dimensions will depend on the type of fastener used but they should not exceed the dimensions given, and should be obtained by the purchaser from the manufacturer.

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2) Cranked links are not recommended for use on chains which are intended for onerous conditions.

3) The actual dimensions will depend on the type of fastener used but they should not exceed the dimensions given, and should be obtained by the purchaser from the manufacturer.

4 Conveyor chains

4.1 General

Except where otherwise stated, the shapes, dimensions and test details for the chain and sprockets shall conform to clauses 3 and 5, respectively, substituting reference to table 2 in place of table 1 where appropriate.

It is usual for chains used for conveyor purposes to have straight-edged (not waisted) side plates. Additionally, an alternative large roller of diameter d_7 may be adopted. These features are illustrated in figure 4.

4.2 Nomenclature

The nomenclature of figure 2 is also applicable to conveyor chains. Figures 2 and 4 do not define the actual form of the chain plates.



Figure 4 — Conveyor chain with large rollers

4.3 Designation

Double-pitch precision roller chains suitable for conveyor purposes are designated additionally with the prefix C when the straight-edged chain plates (figure 4) are used, and with a suffix L when the alternative large size roller (d_7) is adopted. When necessary for the purpose of distinguishing between the chain roller sizes adopted, an optional suffix S may be applied to chains with the small roller.

4.4 Dimensions

When the large roller size is adopted, dimension d_1 shall be replaced by d_7 in wheel formulae. Dimensions shall be in accordance with table 2.

4.5 Length accuracy

The length of plain chain shall be the nominal length subject to the tolerance $^{+0,15}_{0}$ %.

The length of the chain with attachments shall be the nominal length subject to the tolerance $^{+0,25}_{-0,05}$ %.

4.6 Marking

The chains shall be marked with the manufacturer's name or trademark. It is recommended that the chains should be marked with the ISO chain number quoted in table 2.

4.7 Attachments

4.7.1 General

Except when otherwise stated, the dimensions and test details for the chain with attachments shall conform to clause 3.

4.7.2 Designation

Two types of attachment are given, with the common dimensional basis as given in table 3; their designation and distinguishing features are as follows:

K1: with one attachment hole centrally located in each platform,

K2: with two attachment holes longitudinally located,

as shown in figure 5.

4.7.3 Dimensions

Attachments shall conform to the dimensions given in table 3.

4.7.4 Manufacture

The actual form of the K attachment plates is left to the discretion of the manufacturer, but the attachments are normally of integral construction, whereby the chain plates are extended and bent over to make the platform, as shown in figure 5.

The length of the attachment plate is also left to the discretion of the manufacturer, but it should be sufficient to accommodate the attachment holes longitudinally in the case of type K2, and not interfere with the working of the adjoining links. A common length is normally adopted for both types K1 and K2.

4.7.5 Marking

The marking shall be the same as would be shown on the chain plates replaced by an integral construction attachment.

Table 2 — Principal dimensions, measuring forces and tensile strengths

ISO chain number ¹⁾	Pitch p	Roller diameter d_1	Roller diameter (large) d_1	Width between inner plates b_1	Bearing pin body diameter d_2	Bush bore d_3	Chain path depth h_1	Plate depth h_2	Cranked link l_1	Width over inner link b_2	Width between outer link b_3	Width over bearing pin b_4	Additional width for joint fastener ²⁾ b_5	Measuring force	Tensile strength
	max.	max.	max.	min.	max.	min.	min.	max.	min.	max.	min.	max.	max.	N	min. kN
mm															
C 208A	25,4	7,95	15,88	7,85	3,98	4	12,33	12,07	6,9	11,18	11,31	17,8	3,9	120	13,8
C 208B	25,4	8,51	15,88	7,75	4,45	4,5	12,07	11,81	6,9	11,3	11,43	17	3,9	120	18
C 210A	31,75	10,16	19,05	9,4	5,09	5,12	15,35	15,09	8,4	13,84	13,97	21,8	4,1	200	21,8
C 210B	31,75	10,16	19,05	9,65	5,08	5,13	14,99	14,73	8,4	13,28	13,41	19,6	4,1	200	22,4
C 212A	38,1	11,91	22,23	12,57	5,96	5,98	18,34	18,08	9,9	17,75	17,88	26,9	4,6	280	31,1
C 212A-H	38,1	11,91	22,23	12,57	5,96	5,98	18,34	18,08	9,9	19,43	19,56	29,8	4,6	280	31,1
C 212B	38,1	12,07	22,23	11,68	5,72	5,77	16,39	16,13	9,9	15,62	15,75	22,7	4,6	280	29
C 216A	50,8	15,88	28,58	15,75	7,94	7,96	24,39	24,13	13	22,61	22,74	33,5	5,4	500	55,6
C 216A-H	50,8	15,88	28,58	15,75	7,94	7,96	24,39	24,13	13	24,28	24,41	36,7	5,4	500	55,6
C 216B	50,8	15,88	28,58	17,02	8,28	8,33	21,34	21,08	13	25,45	25,58	36,1	5,4	500	60
C 220A	63,5	19,05	39,67	18,9	9,54	9,56	30,48	30,18	16	27,46	27,59	41,1	6,1	780	86,7
C 220A-H	63,5	19,05	39,67	18,9	9,54	9,56	30,48	30,18	16	29,11	29,24	44,3	6,1	780	86,7
C 220B	63,5	19,05	39,67	19,56	10,19	10,24	26,68	26,42	16	29,01	29,14	43,2	6,1	780	95
C 224A	76,2	22,23	44,45	25,22	11,11	11,14	36,55	36,2	19,1	35,46	35,59	50,8	6,6	1 110	124,6
C 224A-H	76,2	22,23	44,45	25,22	11,11	11,14	36,55	36,2	19,1	37,18	37,31	54,0	6,6	1 110	124,6
C 224B	76,2	25,4	44,45	25,4	14,63	14,68	33,73	33,4	19,1	37,92	38,05	53,4	6,6	1 110	160
C 232A-H	101,6	28,58	57,15	31,75	14,29	14,33	48,63	48,2	25,2	46,89	47,02	68,7	7,9	2 000	222,4

NOTE — The basic chain dimensions are identical with those of table 1, with the addition of the large roller diameters. Normally, the side plates are straight (not waisted).

1) The chain numbers are derived from the basic ISO chain numbers of table 1 with the prefix C (for conveyor) and adding, as appropriate, a suffix S (for small roller) or L (for large roller).

Heavy or higher-strength chains are designated with the suffix H.

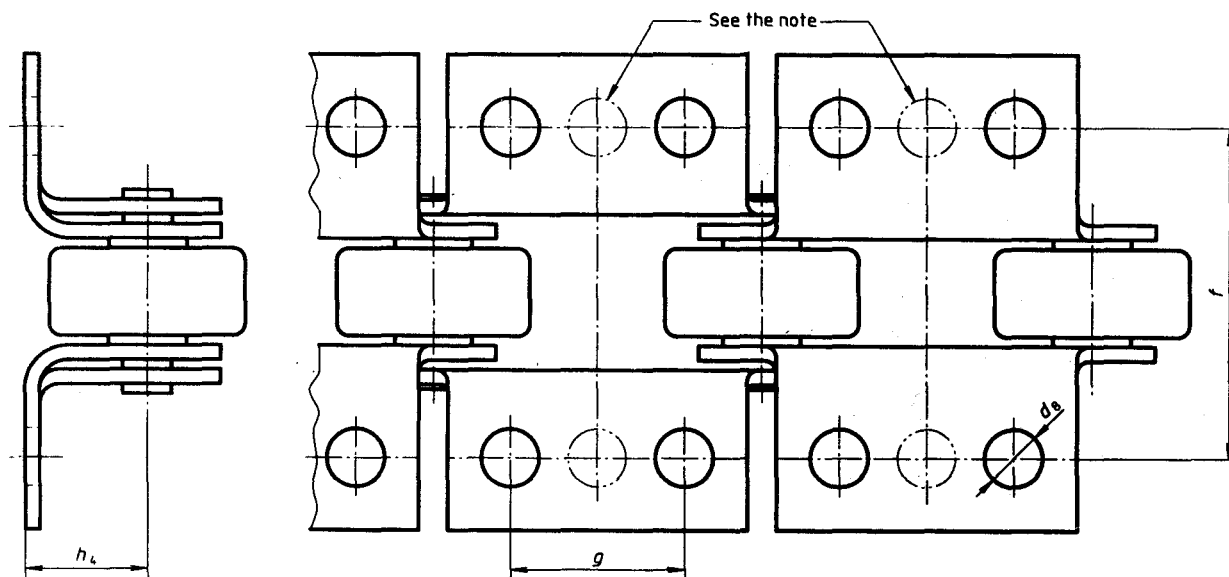
2) The actual dimensions will depend on the type of fastener used but they should not exceed the dimensions given, and should be obtained by the purchaser from the manufacturer.

Table 3 — Dimensions of K attachment plates (see figure 5)

Dimensions in millimetres

ISO chain number ¹⁾	Platform height h_k $\pm 0,4$	Transverse distance between hole centres f $\pm 0,5$	Hole diameter d_h min.	Longitudinal distance between hole centres g $\pm 0,2$
C 208A C 208B	9,1 9,1	25,4 25,4	3,3 4,3	9,5 12,7
C 210A C 210B	11,1 11,1	31,8 31,8	5,1 5,1	11,9 15,9
C 212A C 212A-H C 212B	14,7 14,7 14,7	42,9 42,9 38,1	5,1 5,1 6,6	14,3 14,3 19,1
C 216A C 216A-H C 216B	19,1 19,1 19,1	55,6 55,6 50,8	6,6 6,6 6,6	19,1 19,1 25,4
C 220A C 220A-H C 220B	23,4 23,4 23,4	66,6 66,6 63,5	8,4 8,4 8,4	23,8 23,8 31,8
C 224A C 224A-H C 224B	27,8 27,8 27,8	79,3 79,3 76,2	10,5 10,5 10,5	28,6 28,6 38,1
C 232A-H	36,5	104,7	13,1	38,1

1) Heavy or higher-strength chains are designated with the suffix H.



NOTE — K2 attachment plates each have two attachment holes. K1 plates are similar except that they have one hole, located centrally (see 4.7.2).

Figure 5 — K attachment plates

5 Sprockets

5.1 Nomenclature

The nomenclature for basic chain dimensions on which all sprocket data are based is given in figure 3 and tables 1 and 2.

5.2 Diametral dimensions and tooth shape

5.2.1 Nomenclature

Nomenclature for diametral dimensions and tooth shape is given in figure 6.

5.2.2 Diametral dimensions

5.2.2.1 Pitch-circle diameter, d

$$d = \frac{p}{\sin \frac{180^\circ}{z}}$$

Annex A gives the pitch-circle diameter for unit pitch as a function of the number of teeth.

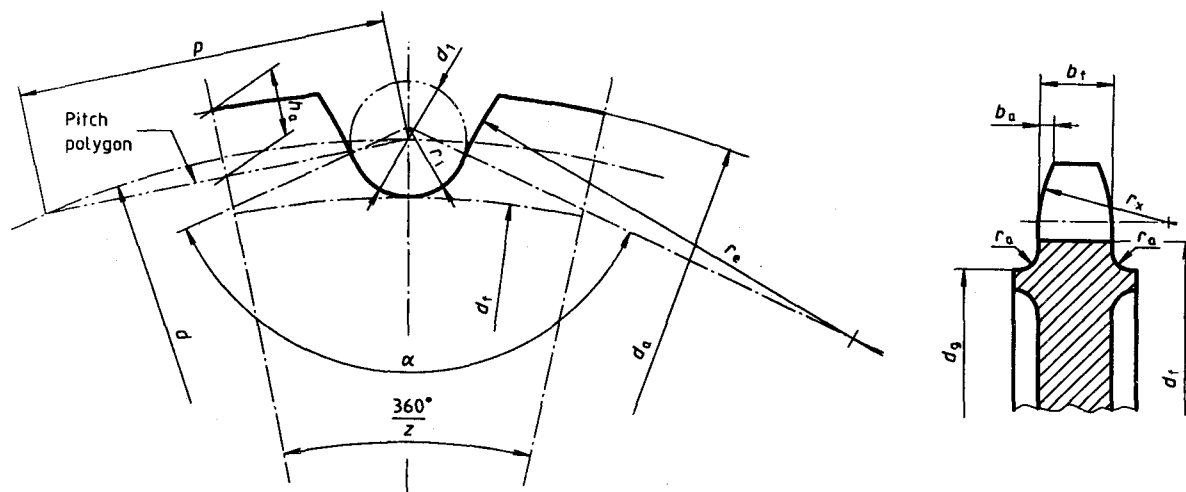
5.2.2.2 Measuring pin diameter, d_R

$$d_R = d_1$$

5.2.2.3 Root diameter, d_f

$$d_f = d - d_1$$

subject to the tolerance limits given in table 4.



b_s = tooth side relief

b_t = tooth width

b_1 = minimum width between inner plates

d = pitch-circle diameter

d_a = tip diameter

d_f = root diameter

d_o = absolute maximum shroud diameter

d_1 = maximum roller diameter

h_a = height of tooth above pitch polygon

h_2 = maximum plate depth

p = chordal pitch, equal to chain pitch

r_s = shroud fillet radius

r_o = tooth flank radius

r_l = roller seating radius

r_x = tooth side radius

z = number of teeth corresponding to the number of links that can be wrapped around the sprocket

z_1 = number of teeth for double-cut sprockets = $2z$

α = roller seating angle

Figure 6 — Diametral dimensions and tooth shape

Table 4 — Tolerance limits for root diameter

Root diameter, d_f mm	Upper deviation	Lower deviation
$d_f \leq 127$	0	0,25 mm
$127 < d_f \leq 250$	0	0,3 mm
$d_f > 250$	0	h111)

1) See ISO 286-2.

5.2.2.4 Measurement over pins (see figure 7)

For an *even* number of teeth:

$$M_R = d + d_R \text{ min.}$$

For an *odd* number of teeth and single-cut sprockets:

$$M_R = d \cos \frac{90^\circ}{z} + d_R \text{ min.}$$

For an *odd* number of teeth and double-cut sprockets:

$$M_R = d \cos \frac{90^\circ}{z_1} + d_R \text{ min.}$$

The measurement over pins of sprockets with an *even* number of teeth shall be carried out over pins inserted in opposite tooth gaps.

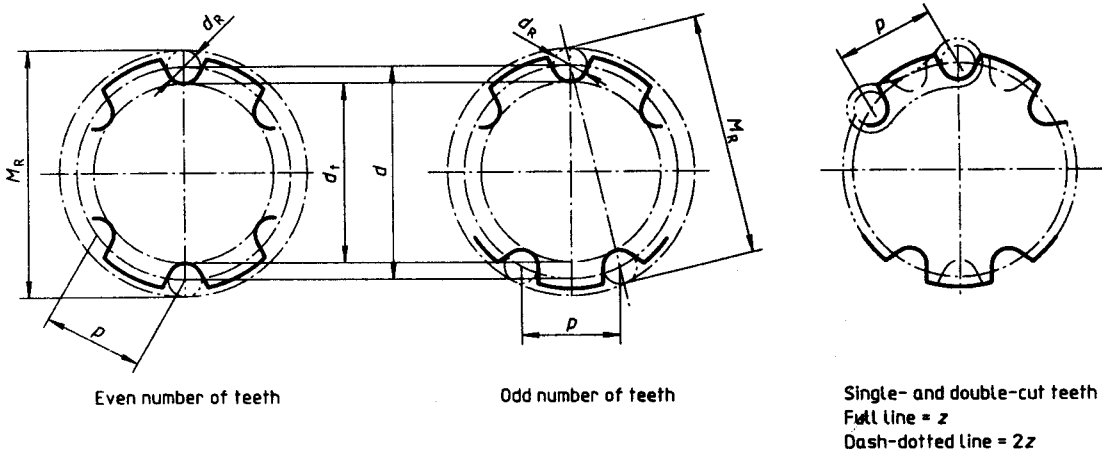
The measurement over pins of sprockets with an *odd* number of teeth shall be carried out over pins in the tooth gaps most nearly opposite.

The limits of tolerance for measurement over pins are identical to those for the corresponding root diameters.

NOTE 1 Sprockets for double-pitch chains may be provided with either one set of teeth having a number of teeth equal to z or with two sets of teeth, the location of the tooth spaces of the second set being midway between those of the first. In this case, the total number of teeth of the wheels will be $z_1 = 2z$.

In the case of a single set of teeth, z will be an integer. In the case of double-cut sprockets, z_1 will be an integer, but z will be fractional if z_1 is an odd number.

Short-pitch base chains should not be used with double-cut sprockets made for extended-pitch chains and *vice-versa*.



- d = pitch-circle diameter
- d_f = root diameter
- d_R = measuring pin diameter
- M_R = measurement over pins
- p = chordal pitch, equal to chain pitch

Figure 7 — Measuring pin size

5.2.2.5 Tip diameter

$$d_a \text{ max.} = d + 0,625p - d_1$$

$$d_a \text{ min.} = d + p \left(0,5 - \frac{0,4}{z} \right) - d_1$$

It should be noted that $d_a \text{ max.}$ and $d_a \text{ min.}$ can be applied arbitrarily both to the minimum and maximum tooth gap forms, subject to the limitations imposed by the cutter on the maximum diameter.

To facilitate the construction of the tooth gap form to a large scale on a drawing board, the tooth height above the pitch polygon can be obtained from the following formulae:

$$h_a \text{ max.} = p \left(0,3125 + \frac{0,8}{z} \right) - 0,5d_1$$

$$h_a \text{ min.} = p \left(0,25 + \frac{0,6}{z} \right) - 0,5d_1$$

Note that $h_a \text{ max.}$ is related to $d_a \text{ max.}$ and $h_a \text{ min.}$ to $d_a \text{ min.}$

5.2.3 Tooth gap form

The actual tooth gap form which is provided by cutting or by an equivalent method shall have tooth flanks of a form lying within the minimum and maximum flank radii and blending smoothly with the roller seating curve subtending the respective angles.

5.2.3.1 Minimum form

$$r_e \text{ max.} = 0,12d_1(z + 2)$$

$$r_i \text{ min.} = 0,505d_1$$

$$\alpha \text{ max.} = 140^\circ - \frac{90^\circ}{z}$$

5.2.3.2 Maximum form

$$r_e \text{ min.} = 0,008d_1(z^2 + 180)$$

$$r_i \text{ max.} = 0,505d_1 + 0,069 \sqrt[3]{d_1}$$

$$\alpha \text{ min.} = 120^\circ - \frac{90^\circ}{z}$$

*) See ISO 286-2.

5.2.3.3 Tooth width

$$b_t = 0,95b_1: h14^*)$$

NOTE 2 $b_t = 0,93b_1: h14$ may be used by agreement between user and manufacturer.

5.2.3.4 Tooth side relief

$$b_{a \text{ nom}} = 0,065p$$

5.2.3.5 Absolute maximum shroud diameter

$$d_g = p \cot \frac{180^\circ}{z} - 1,05h_2 - 1 - 2r_a \text{ mm}$$

5.2.3.6 Tooth side radius

$$r_x \text{ nom} = 0,5p$$

5.3 Radial run-out

Radial run-out, measured on one complete turn of the sprocket, with reference to the bore and root diameter, shall not exceed a total indicator reading greater than the larger of the two following values:

0,000 8 d_t + 0,08 mm, or 0,15 mm, up to a maximum of 0,76 mm.

5.4 Axial run-out (wobble)

Axial run-out, measured on one complete turn of the sprocket with reference to the bore and the flat part of the side face of the teeth, shall not exceed a total indicator reading of

0,000 9 d_t + 0,08 mm, up to a maximum of 1,14 mm.

For fabricated (welded) sprockets, a minimum of 0,25 mm may be accepted if the above formula gives smaller values.

5.5 Pitch accuracy of sprocket teeth

Pitch accuracy of sprocket teeth is important and chain manufacturers should be consulted for details.

5.6 Preferred range of teeth

This International Standard primarily applies to a range of teeth from 5 to 75 inclusive (with intermediate numbers of teeth 5 1/2 to 74 1/2 inclusive).

The preferred range of numbers of teeth is 7, 9, 10, 11, 13, 19, 27, 38 and 57.

5.7 Bore tolerance

Unless otherwise agreed between the manufacturer and the purchaser, bore tolerances shall be H8^{*)}.

5.8 Marking

It is recommended that sprockets should be marked with the following:

- a) manufacturer's name or trademark;
- b) number of teeth;
- c) chain designation (the ISO chain number or manufacturer's equivalent).

^{*)} See ISO 286-2.

Annex A (normative)

Pitch-circle diameters

Table A.1 gives the correct pitch-circle diameters for sprockets to suit a chain of unit pitch. The pitch-circle diameters for sprockets to suit a chain of any other pitch are directly proportional to the pitch of the chain.

Table A.1 — Pitch-circle diameters

Number of teeth <i>z</i>	Pitch-circle diameter, <i>d</i> , for unit pitch ¹⁾	Number of teeth <i>z</i>	Pitch-circle diameter, <i>d</i> , for unit pitch ¹⁾	Number of teeth <i>z</i>	Pitch-circle diameter, <i>d</i> , for unit pitch ¹⁾	Number of teeth <i>z</i>	Pitch-circle diameter, <i>d</i> , for unit pitch ¹⁾
5	1,701 3	23	7,343 9	41	13,063 5	59	18,789 2
5 1/2	1,849 6	23 1/2	7,502 6	41 1/2	13,222 5	59 1/2	18,948 2
6	2	24	7,661 3	42	13,381 5	60	19,107 3
6 1/2	2,151 9	24 1/2	7,82	42 1/2	13,540 5	60 1/2	19,266 5
7	2,304 8	25	7,978 7	43	13,699 5	61	19,425 5
7 1/2	2,458 6	25 1/2	8,137 5	43 1/2	13,858 5	61 1/2	19,584 7
8	2,613 1	26	8,296 2	44	14,017 6	62	19,743 7
8 1/2	2,768 2	26 1/2	8,455	44 1/2	14,176 5	62 1/2	19,902 9
9	2,923 8	27	8,613 8	45	14,335 6	63	20,061 9
9 1/2	3,079 8	27 1/2	8,772 6	45 1/2	14,494 6	63 1/2	20,221
10	3,236 1	28	8,931 4	46	14,653 7	64	20,38
10 1/2	3,392 7	28 1/2	9,090 2	46 1/2	14,812 7	64 1/2	20,539 3
11	3,549 4	29	9,249 1	47	14,971 7	65	20,698 2
11 1/2	3,706 5	29 1/2	9,408	47 1/2	15,130 8	65 1/2	20,857 5
12	3,863 7	30	9,566 8	48	15,289 8	66	21,016 4
12 1/2	4,021 1	30 1/2	9,725 6	48 1/2	15,448 8	66 1/2	21,175 7
13	4,178 6	31	9,884 5	49	15,607 9	67	21,334 6
13 1/2	4,336 2	31 1/2	10,043 4	49 1/2	15,766 9	67 1/2	21,493 9
14	4,494	32	10,202 3	50	15,926	68	21,652 8
14 1/2	4,651 8	32 1/2	10,361 2	50 1/2	16,085	68 1/2	21,812 1
15	4,809 7	33	10,520 1	51	16,244 1	69	21,971
15 1/2	4,967 7	33 1/2	10,679	51 1/2	16,403 1	69 1/2	22,130 3
16	5,125 8	34	10,838	52	16,562 2	70	22,289 2
16 1/2	5,284	34 1/2	10,996 9	52 1/2	16,721 2	70 1/2	22,448 5
17	5,442 2	35	11,155 8	53	16,880 3	71	22,607 4
17 1/2	5,600 5	35 1/2	11,314 8	53 1/2	17,039 3	71 1/2	22,766 7
18	5,758 8	36	11,473 7	54	17,198 4	72	22,925 6
18 1/2	5,917 1	36 1/2	11,632 7	54 1/2	17,357 5	72 1/2	23,084 9
19	6,075 5	37	11,791 6	55	17,516 6	73	23,243 8
19 1/2	6,234	37 1/2	11,950 6	55 1/2	17,675 6	73 1/2	23,403 1
20	6,392 5	38	12,109 6	56	17,834 7	74	23,562
20 1/2	6,550 9	38 1/2	12,268 5	56 1/2	17,993 8	74 1/2	23,721 3
21	6,709 5	39	12,427 5	57	18,152 9	75	23,880 2
21 1/2	6,868 1	39 1/2	12,586 5	57 1/2	18,311 9		
22	7,026 6	40	12,745 5	58	18,471		
22 1/2	7,185 3	40 1/2	12,904 5	58 1/2	18,630 1		

1) This is sometimes referred to as "unit pitch-circle diameter".

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